September 23, 1996

EX PARTE

William F. Caton, Acting Secretary
Federal Communications Commission
1919 M Street, N.W.- Rm. 222
Washington, D.C. 20554

Re: CS Docket No. 96-45

Dear Mr. Caton:

On September 16, 1996 Susan Baldwin and Michael DeWinter of Economics and Technology, Inc. met with state and federal staff members of the Federal-State Joint Board. On behalf of The National Cable Television Association, Susan and Michael presented a detailed discussion of the cost drivers of the Benchmark Cost Model 2.

Those participating included: Brad Wimmer, C. Anthony Bush, Alex Belinfante, and Bob Loube of the FCC. Those from state offices included Barry Payne, Lorraine Kenyon, Brian Roberts, Sandra Makeeff, and Sam Loudenslager.

Please find attached a copy of the handouts that Susan Baldwin and Michael DeWinter distributed to the participants.

If you have any questions concerning this matter, please contact the undersigned.

Sincerely,

Teresa A. Pitts
Richard Cimerman
Directors, State Telecommunications Policy

MAKING ADJUSTMENTS TO THE BCM2

A Supplementary "Hands-On" Manual

by

Paul S. Keller
Michael J. De Winter
Susan M. Baldwin

ECONOMICS AND
TECHNOLOGY, INC.

MAKING ADJUSTMENTS TO THE BCM2: A Supplementary "Hands-On" Manual[1]

Basic Installation and Operating Instructions for Performance of "Default" BCM2 Runs

Overview

The Benchmark Cost Model 2 (BCM2) installs to a BCM directory and creates state subdirectories when you execute the Setup.bat file located on the CD. The BCM2 is made up of three EXCEL version 5.0 workbooks. The BCM2CNTL.XLS is a controlling workbook that contains the license agreement, registration and user interface (it also contains an "additional options" area where you can re-specify the copper/fiber crossover point).[2] The BCM2.XLS is the processing workbook that contains the input tables worksheet, main logic sheet and summary reports. The SUMMASK.XLS is a summary results report with graphs. To run BCM2 without any adjustments (i.e., to get "Default" BCM2 results), retrieve the workbook BCM2CNTL.XLS. From the user interface screen, you can select the state or states to process, opt to print the summary report or save the workbook. Once the BCM2 is saved, you must retrieve the saved model (*st*BCM2.XLS where *st* is the state abbreviation); the user interface is no longer available on a saved BCM2.XLS workbook.

Installation

Execute the Setup.bat file located on the CD. The BCM2 will install to a BCM directory, create state subdirectories and move the appropriate files to the subdirectories.[3] You must enter a one character drive letter (C through Z) during the installation process, this drive can be a desktop or LAN drive. The CD contains about 75 megabytes of data, so make sure you have ample disk space available on the drive before installing. If you have limited disk space, you can install BMC2 manually by creating the appropriate BCM directory and state subdirectories and then moving the appropriate ".XLS" files to the BCM directory and *st*DTIN2.XLS files to the state subdirectories. If, for instance, you only want to process one

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1. This document is intended to supplement the documentation provided by the BCM2 Sponsors and is *not* intended to serve as a comprehensive guide to the BCM2. It was prepared by Paul S. Keller, Michael J. De Winter and Susan M. Baldwin of ETI.

2. Performing a run with adjustments to this variable is discussed further beginning on page 9 of this manual. It is also possible, within this "additional options" box, to select an alternative Benchmark Cost value. This too is explained later (see p. 14).

3. In the event that the setup process fails, you must manually duplicate the file structure of the CD-ROM on your hard disk or LAN drive.

state, then the amount of disk space required is substantially reduced and a manual transfer of the appropriate files is optimal.

Instructions for Running BCM2

Retrieve the file BCM2CNTL.XLS from the BCM root directory. If retrieving for the first time, you will be asked to input a one character drive letter. Enter the same one that was used in the installation instructions above. After the drive letter is entered, the workbook will resave itself so that this question will not be asked again. You can change the drive letter at any time by using the CHANGE DRIVE LETTER button on the Control sheet of the workbook.

You must, of course, read the **license** agreement and press the "I ACCEPT THIS AGREEMENT" button to continue. If you do not accept **this** agreement, the model will terminate **execution.** (The text of the license agreement is included in Appendix A.)

The processing can be a lengthy process depending on the number of CBGs and the speed of your computer. According to the BCM2 Sponsors, typically, a state with 3000 CBGs will take approximately 20 minutes to process if you have a machine with 128 megabytes of memory and a 120 megahertz processor. (See Table 1, which ranks states by the number of CBGs.)

Single State Processing

Select the state to process from the list box (territories are not yet available) in the BCM2CNTL.XLS file.[4] Press the PROCESS SELECTED STATE OR STATES button to continue processing the BCM2. After processing the state, you can save the workbook to your hard disk by pressing the SAVE WORKBOOK button. This will save as *st*BCM2.XLS, where *st* is the state abbreviation. You have the option to create a summary results file by selecting the SAVE RESULTS button. This creates a file named *st*_RSLTS.XLS which is the same report as the SUMMARY tab of BCM2.XLS; the only difference is the graphics package.

4. As mentioned before, you have the option of changing the copper/fiber crossover point (a.k.a., the cable breakpoint) or the $80 benchmark cost value by selecting ADDITIONAL OPTIONS, but we are discussing "Default" runs of the model in this section; discussion of these additional options is covered on pages 9 and 14, respectively.

TABLE 1

States Ranked by Quantity of CBGs

RANK	STATES	CBGs
1	California	20923
2	New York	15589
3	Texas	15457
4	Pennsylvania	11688
5	Illinois	10648
6	Ohio	10418
7	Michigan	9521
8	Florida	8849
9	New Jersey	6857
10	North Carolina	5635
11	Massachusetts	5521
12	Indiana	5391
13	Missouri	5077
14	Georgia	5047
15	Wisconsin	4919
16	Virginia	4655
17	Washington	4542
18	Minnesota	4394
19	Tennessee	4326
20	Louisiana	3960
21	Alabama	3789
22	Oklahoma	3636
23	Maryland	3615
24	Kentucky	3507
25	Colorado	3360
26	Arizona	3315
27	South Carolina	3194
28	Kansas	2928
29	Iowa	2917
30	Connecticut	2879
31	Oregon	2601
32	Mississippi	2379
33	Arkansas	2391
34	Nebraska	1935
35	West Virginia	1795
36	New Mexico	1535
37	Utah	1316
38	Maine	1284
39	Idaho	1111
40	North Dakota	1104
41	Montana	1017
42	New Hampshire	1005
43	South Dakota	978
44	Rhode Island	879
45	Nevada	798
46	Wyoming	733
47	Vermont	593
48	Hawaii	561
49	District of Columbia	545
50	Delaware	519
	TOTAL	221596

Multi State Processing

Select the states to process from the list box. Whenever you run multiple states, you must select the ADDITIONAL OPTIONS button and specify whether you want to print each state's summary report or to save each workbook or Summary Results files. Press the PROCESS SELECTED STATE OR STATES button to continue processing the BCM2. At completion of the processing, the last state selected will remain open. The workbooks will be saved as *st*BCM2.XLS where *st* is the state abbreviation and, similarly, the summary results files are saved as *st*_RSLTS.XLS. If you are confronted with disk space limitations, it is strongly suggested that you only save the results files when performing multi-state runs.[5]

Retrieving a Saved BCM2 Workbook

Once the BCM2.XLS workbook has been saved, you can no longer go through the user interface in BCM2CNTL.XLS. Just retrieve the workbook *st*BCM2.XLS. (*If asked to re-establish links, press the "No"* button.) You can then move around the workbook as you like. You cannot, however, change any calculations on the Main Logic sheet. The Main Logic sheet was not set up to print by the model developers, so if printing is necessary, you must go through the File, PageSetup options on the EXCEL menu bar.

Running a single company through the BCM2

The best way to run one company through BCM2 is to start with the *st*DTIN2.XLS input File. Make sure you have saved a copy of the original *st*DTIN2.XLS files you wish to alter under a different name before you make changes (if you possess the CD-ROM, of course, you already have this copy in a Read-Only format on the CD itself). Retrieve the *st*DTIN2.XLS input file and sort by company name. Remove the unwanted companies by deleting the appropriate rows. Resort the file by CLLI and Quadrant and resave the file as *st*DTIN2.XLS and then run BCM2 as described above. If you have two or more input files, you must remove the unwanted companies from each file and resave. If you want the original files restored, rename them as the *st*DTIN2.XLS input file (or, again, copy them back over to your hard disk from the CD-ROM, but remember that you will need to remove the Read-Only attribute after the file is transferred, as we discuss on page 5).

5. The *st*BCM2.XLS files are approximately 14 megabytes each, whereas the *st*_RSLTS.XLS files are about 64 kilobytes.

Making adjusted "runs" of the BCM2

Basics

If you want to change a user input on the "Table Inputs" sheet (see Appendix B for a summary of the contents of this sheet), you should do this before you process a state. The calculation time on the model can be quite long. It is usually faster to rerun the model with the changed input than to change the input and recalculate the workbook. To change the inputs, retrieve the BCM2.XLS workbook and select the "Table Inputs" Tab. First remove the read-only attribute (see below), then change the inputs and resave the file as BCM2.XLS. Then run as instructed above.

Removing the Read-Only Attribute

This is an important step that must be taken before you can save the changes you are going to make to the BCM2.XLS and/or *st*DTIN2.XLS file(s). Using the file manager in windows, you can remove the Read-Only attribute as follows:

(1) Highlight the file or files whose attributes you want to change
(2) Select **File**
(3) Select **Properties**
(4) In the attributes box within properties, click on the **Read-Only** box so that the "X" is removed

Now your files are ready to be altered. Any time you wish to start fresh with the default BCM2, you can simply re-copy the original files from the CD-ROM over the manipulated files on your hard disk or LAN drive. You will need to eliminate the read-only characteristic each time, however.

Two basic types of adjustments

There are two basic types of adjustments that can be made in the BCM2. The first type involve changes to the input variables that directly impact the calculation of the monthly cost of providing basic residential local exchange service in a given state or states. These include the major cost drivers such as the structure cost multipliers, the charge factors applied to investment, feeder and distribution fill factors, and others. The second set of adjustments do not change the calculated cost, but instead affect the amount of Universal Service Funding that would be granted at a given cost. These two types of adjustments are described in the following sections.

Changing the Major Cost Drivers of Basic Residential Local Exchange Service

On the pages which follow, we show you how to alter some of the user-adjustable inputs to the BCM2.[6] Once you have experimented with making some of these adjustments, it will become easier for you to make adjustments to other variables as you see fit. This user manual focuses on the major cost drivers of the BCM2 as identified in our August 1996 report *Converging on a Cost Proxy Model for Primary Line Basic Residential Service: A Blueprint for Designing a Competitively Neutral Universal Service Fund.* (These cost drivers apply to other cost proxy models as well.) For each of the major cost drivers we:

(1) Provide a description of the cost driver.
(2) Show the results of our sensitivity analysis for the cost driver. In essence, we answer the basic question: "What is the magnitude of the impact of altering this particular cost driver, *ceteris paribus* (i.e., with all other factors left at the BCM2 default values)?"[7] The results shown are for Washington State, where the default BCM2 statewide average monthly cost generated by BCM2 is $29.41.
(3) Explain where to find this cost driver in the BCM2.[8]
(4) Explain, mechanically, how this cost driver can be altered.

A summary of the individual sensitivity analyses contained in the August 1996 report is attached as Appendix C.

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6. In some cases, the Sponsors may contend that the analysis undertaken is in violation of their license agreement. In the context of a contested proceeding, however, ETI believes that such contentions are erroneous.

7. It should be noted that the following section of the guide is organized, generally, by the magnitude of the impact of each cost driver, from the largest to the smallest.

8. There are several places where these variables exist in the model. A large number are contained in the primary "USER INPUTS TO MODEL" table within the "Table Inputs" worksheet. As we shall discuss in more detail below, however, there are other tables of inputs contained in this worksheet which can be altered, such as the structure cost multipliers and feeder and distribution fill factors, even though they were not intended to be altered by the model's designers. Two other variables are located in the control panel file.

Cost Driver: Cost Factors

Description: These are the charge factors that are applied to the total investment per line yielded by the model, and are intended to reflect operating expenses (including depreciation) and after-tax return on investment. BCM2 uses four separate factors to translate plant investment and expenses into a monthly cost. The BCM2 default values for the three investment-related factors are as follows:

Cable and Wire Investment	0.23276
Circuit Equipment Investment	0.24241
Switching Equipment Investment	0.25703

BCM2 also assigns 75% of an assumed total amount of $133.39 per line to reflect those non-plant-related expenses (such as marketing and customer operations) that (1) vary according to the number of lines served and (2) support local service.

Impact: Substituting the single forward-looking cost factor from the original BCM for the cost factors in BCM2 leads to a reduction from the default value (in Washington State) of $29.41 to $20.35. We also conducted a separate sensitivity analysis, in which we left the three investment factors intact, but reduced the allocation factor (default of 75%) for the non-plant-related expense factor to 20% and then zero, respectively, with corresponding results of $23.29 and $21.07 for Washington State. This translates into a 30% or 37% decrease in support at the $30 benchmark.

Location: The cost factors feed into the "Plant Related Annual Cost" and "Other Annual Cost" calculations in Columns FA and FB, respectively, in the "Main Logic" worksheet (see Appendix D), and the input variables themselves appear in the "User Inputs to Model" table in the "Table Inputs" worksheet.

How to Adjust: The four variables that can be adjusted are located in the "User Inputs to Model" table in the "Table Inputs" worksheet in the BCM2.xls file. The relevant variables are the CableWireFactor1, ElectronicsFactor1, SwitchingFactor1, OtherFactor1, and OtherAllocRatio1. (Note: ETI's sensitivity analyses leave the OtherFactor1 at the default value of $133.39 for the loading per line.) Simply type your adjusted number(s) into the cell(s), overwriting the existing default value(s).

Cost Driver: Structure Cost Multipliers

Description: The structure cost multipliers or "Weighted cost Factors" in the BCM2 account for the structure and placement costs of outside plant. The multipliers reflect the plant type (fiber feeder, copper feeder or distribution plant), and the CBG's household density and bedrock hardness.

Impact: The impact of replacing the BCM2's structure cost multipliers with those from the original BCM is to reduce the average monthly cost from $29.41 in Washington State to $20.21, a $9.20 decrease. This adjustment, made in isolation, yields an 81% reduction in support at the $30 benchmark for Washington State.

Location: The "Cost Factor Table" in the "Table Inputs" sheet in BCM2.XLS contains the relevant "Weighted Cost Factors" for distribution, feeder and fiber for each density zone and surface category (i.e., rock hard, rock soft, and normal). These feed into the formulae in the "Main Logic" sheet (Columns AE, AF and AG) where the calculations of the Distribution, Feeder and Cable Multipliers are performed.

How to Adjust: Copy the values from the BCM Weighted Cost Factor Table over the BCM2 Weighted Cost Factor Table in the "Table Inputs" sheet in BCM2.xls.

Cost Driver: Copper/Fiber Crossover Point

Description: This variable feeds into the algorithm which determines when to deploy fiber rather than copper in the feeder plant. The deployment of fiber also requires the use of digital loop carrier equipment, which is a significant component of the total average cost per line.

Impact: Default value of $29.41 for the statewide average monthly cost in the State of Washington declines to $28.70 and $28.14, respectively, when alternate crossover points of 15,000 feet and 18,000 feet are chosen. It increases to $30.25 if the 9,000 foot mark is chosen. Choosing the 18,000 foot point leads to a corresponding reduction of approximately 5% in support at the $30 benchmark level for Washington State.

Location: This user input, unlike the others, is adjusted through the BCM2CNTL.XLS "Control Panel" file. DO NOT CHANGE THIS INPUT IN THE BCM2.XLS FILE (it appears at the bottom of the "USER INPUTS TO MODEL" Table)!

How to Adjust: This adjustment is made by clicking on the "Additional Options" button in the BCM2CNTRL.XLS, then clicking on the desired number in the "Breakpoint" box. The default crossover point is set at 12,000 feet; you have the option of selecting, instead, crossover points of 9,000, 15,000 or 18,000 feet. No other crossover points are allowed.

Cost Driver: Objective Fill Factors

Description: These are the fill factors used for deploying outside plant and are broken down separately for feeder and distribution as well as by the various density zones. BCM2 also contains separate fill factors for switching, electronics, and high capacity multiplexers, with default values of 80%, 85%, and 95%, respectively.

Impact: The impact of changing these fill factors to 95% is to reduce the average monthly cost from $29.41 in Washington State to $28.39, a $1.00 decrease. This adjustment, taken in isolation, yields an approximate 14% reduction in support at the $30 benchmark for Washington State.

Location: The fill factors for feeder and distribution are located in a table that is separate from the "User Inputs to Model" table; it is, however, located in the same "Table Inputs" worksheet in the BCM2.xls file. After getting into the "Table Inputs" worksheet, you should go to cell I30. There you will see the following table:

DENSITY	FEEDER	DISTRIBUTION
0	0.75	0.40
5	0.80	0.45
200	0.80	0.55
650	0.85	0.65
850	0.85	0.75
2550	0.85	0.80

How to Adjust: Simply replace the values in the Feeder and Distribution columns in the table referenced above with the revised fill factors you desire. To revise the other fill factors (i.e., switching, electronics or hi-cap), go to the "User Inputs to Model" table. Switching is located in cell B37, Electronics in cell B20, and Hi-Cap in cell B21, respectively.

Cost Driver: Digital Switching Discount

Description: This factor is included in BCM2 to reflect the vendor discounts on switching equipment and is applied to the total switching investment, developed on a per-line basis. Use of a higher discount factor further reduces the level of estimated switching investments.

Impact: Adjusting the Digital Switching Discount from the default value of 20% up to a revised 50%, reduced the average monthly per-line cost in Washington State from $29.41 to $28.43, essentially a $1.00 impact.

Location: The Digital Switching Discount is located in the "User Inputs to Model" table in the "Table Inputs" worksheet in the BCM2.xls file, in cell B27. This variable feeds into Switching Cost Ratio which then feeds into the calculation of switching costs in the "Main Logic" file; see Column EU, where "Total Switch Investment Per Line" is calculated.

How to Adjust: To adjust this factor, simply go to cell B27 in the "User Inputs to Model" table in the "Table Inputs" worksheet in the BCM2.xls file. It is labeled (in the column just to the right of the data cell) as the Digital Switching Discount and is entered as a whole percentage.

Accounting for Economies of Scale and Scope in the BCM2

As described in our April and August Reports, the BCM and BCM2 do not reflect the economies of scale and scope inherent in the provision of *all* services over a single multi-purpose network. These economies should be flowed back to primary residential basic exchange service before any assessment of universal service funding is made.[9] In our August Report, we estimated the level of the economies by conducting two additional runs of the BCM2 to model the two following scenarios:[10]

- Network A — A stand-alone network sized to support only first residential access line demand. In this case, we set the residence lines per household multiplier equal to 1.00 (rather than the default value of 1.21) and eliminated business lines entirely from the input data. For this run, we assumed the BCM2's default fill factors.

- Network B — A stand-alone network designed to support all services *other than the initial residential access line.* For this network, we set the residence lines per household multiplier equal to 0.21 and left the business lines at the BCM2's default values. For this run, we assumed the BCM2's default fill factors.

Once these two individually engineered networks are developed, the resulting total investment figures are then summed to compute the combined cost (this result is shown in Column "C" of Table 2, on the following page). This combined cost can then be compared to a network constructed to serve all of the services encompassed by Networks A and B, that is, the network represented by the BCM2 default (Network D). The difference between the cost of Network D and the combined cost of Networks A and B represents the investment savings, i.e., the amount that should be flowed back, at least in part, to primary line residential customers (in other words, the customers of Network A).

9. See Chapter 6 of ETI's April 1996 Report, particularly Section 6.2 (pp. 101-107). See also Chapter 6 of ETI's August Report pp. 105-109.

10. The results of these runs, and the result of the BCM2 default run are in Appendix 6B of ETI's August Report.

Table 2

Calculation of Total Savings from Economies of Scale*

(Network A) Single line Residential	(Network B) Add'l Residence Lines and Business	(C) Sum of Networks A & B	(Network D) Default: Combined Network	(E) Total Savings (C)-(Network D)
$2,953,941,637	$2,563,892,069	$5,517,833,706	$3,501,878,128	$2,015,955,578

* Non-plant-related expenses (i.e., Other Annual Cost) are excluded because they are identical for all three networks.

Table 2 shows that there is an approximate $2-billion savings in investment associated with the fact that one combined network serves all demand rather than deploying two separate stand-alone networks. As we have explained, a substantial portion of this benefit of scope should properly inure to universal service. Table 3 below calculates the economy that should flow back to the cost of primary residential access lines under two scenarios: 1) Economies flow back to all lines; 2) Economy flows back to households only.

Table 3: Two Options for Flowing Economies back to the Cost of Basic Single Line Residential Service (Network A)

	Option 1: Economy flows back to all lines	Option 2: Economy flows back to all households
(a) Economy of Scale in terms of investment	$2.0-billion	$2.0-billion
(b) Number of Lines	3,293,923	1,875,508
(c) Economy per line (a)/(b)	$607	$1,066
(d) Cost Factor	.2297	.2297
(e) Annual Cost Savings per line (c) * (d)	$139.47	$244.95
(f) Monthly Cost Savings per line (e)/12	$11.62	$20.41
(g) Stand Alone Average Monthly Cost Network A	$39.12	$39.12
(h) Network A less Economies (g) - (f)	$27.50	$18.71

Changing the Major Drivers of the Universal Service Funding Requirement

In addition to making changes to the major cost drivers of basic residential local exchange service identified above (and other potential cost drivers not yet explored), there are adjustments to the BCM2 that can be made that directly affect the amount of Universal Service Funding that would be granted. Two of these important alterations, changing the benchmark support threshold and aggregating costs to the wire center level are discussed in some detail below.

Changing the support threshold

The BCM2, in its default mode, gives results for Aggregate Support at $10 intervals from a $20 benchmark up to an $80 benchmark value. The model, however, is designed to allow you to substitute any support price threshold you desire in place of the $80 benchmark. Suppose, for example, that you wish to see what support would be given at the $25 benchmark for a default run of Washington State.

In the BCM2CNTL.XLS file, you will see an "Additional Options" button. Clicking on this button brings you into a box where you can choose, among other things, to revise the $80 benchmark level; simply click on this option and input the new value you wish to substitute. Since, in this example, you are not making changes to any other input values, you are now ready to perform the run. The summary results file will show, in the Aggregate Support listing, a new aggregate support benchmark of $25 and the corresponding level of support, which, in the case of the Washington State default run equals $191,904,350, or 31% lower than the $279,458,573 granted at the $20 threshold.

This exercise can be especially useful, if, for example, you note that there is a substantial drop in support from one threshold level to next. In the case of our National "Alternative Results" run (see Appendix E), for example, we found that in some states the levels decline rather steadily (e.g., Arizona, which would receive $20.3, $11.6, and $7.3 million in support at the $20, $30, and $40 benchmark levels, respectively) while other states, such as Florida ($12.7, $2.8, and $1.1 million at the same $20, $30, and $40 benchmarks) show a precipitous decline between the $20 and $30 levels. In the latter case, especially, it might be very useful to look at a number of alternative benchmarks between these two values.

You should keep in mind that this alternate price threshold does not in any way affect the *cost* computed by the BCM2, but only the amount of USF support the model purports should be granted at the revised benchmark.

Wire Center Aggregation

Overview

The wire center aggregation analysis consists of calculating the total cost for all of the CBGs in a wire center and comparing that total against a user-specified benchmark price. The purpose of the calculation is to assess the universal service funding requirement at the wire center level instead of at the CBG level.

Process

This analysis requires several steps and must be performed in a new Excel spreadsheet file created by the user.

1) If the state contains multiple input files, the user must process the state having selected the "Save each Workbook" option so that results from multiple input files are saved.

2) After the state has been processed, the contents of the Main Logic sheet must be copied to a new Excel spreadsheet file created by the user. It is only necessary to select the column headings and all rows that contain processed data. This data should be copied so that the column headings are located in row 4 of the new spreadsheet. If the state required two or more workbooks for processing, the user must copy each to the new file. The new file should contain only one row of column headings, however, with all of the processed data immediately below the column headings and no blank rows between data sets.

Working in the columns to the right of the processed data, complete the following:

3) Label column GH (cell GH4) "Wire Center Number." In cell GH5, enter the number 1. In cell GH6, enter the following formula: =IF(A6=A5,GH5,GH+1). This formula will assign all of the CBGs in the same wire center the same number, the first wire center being "1." After entering this formula, use the "Fill Down" command under the "Edit" menu to fill the formula down for the entire data set.

4) In cell GI4, type the label "Total Annual Cost (Column FC)." In cell GI5 type the following formula: = FC5. Fill this formula down for the entire data set as above. This formula simply replicates column FC of the "Main Logic" sheet titled "Total Annual Cost."

5) In cell GJ4, type the label "Total Households (Column I)." In cell GJ5, type the following formula: =I5. Fill this formula down for the entire data set.

6) In cell GK4, type the label "Annual Cost per CBG (GI * GK)." In cell GK5, type the following formula: =GI5*GJ5. Fill this formula down.

7) In cell GL4, type the label "Cumulative Annual Cost per Wire Center." In cell GL5, type the following: =GK5. In cell GK6, type the following: =IF(A6=A5,GL5+GK6,GK6). Fill this formula down.

8) In cell GM4, type the label "Cumulative Annual Cost per Wire Center (last CBG)." In cell GM5 type the following: =IF(A5=A6,"",GL5). Fill down this formula.

9) In cell GN4, type the label "Annual Support Benchmark per CBG using Households and $20." In cell GN5 type the following: =20*12*GJ5. Fill down this formula.

10) Label Cell GO4 "Cumulative Annual Support Benchmark for the wire center using households and $30. In cell GO5 type: =GN5. In cell GO6 type: =IF(A6=A5,GO5+GN6,GN6). Fill down this formula.

11) Label Cell GP4 "Annual Support Benchmark per CBG using Households and $30." In cell GP5, type: =30*12*GJ5. Fill down this formula.

12) Label Cell GQ4 "Cumulative Annual Support Benchmark for the wire center using households and $30." In cell GQ5 type: =GP5. In cell GQ6 type: =IF(A6=A5,GO5+GP6,GP6). Fill down this formula.

13) Label Cell GR4 "Annual Support Benchmark per CBG using Households and $40." In cell GR5 type: =40*12*GJ5. Fill down this formula.

14) Label Cell GS4 "Cumulative Annual Support Benchmark for the wire Center using households and $40." In cell GS5, type: =GR5. In cell GS6 type: =IF(A6=A5,GS5+GR6,GR6). Fill down this formula.

15) Leave column GT blank.

16) Label Cell GU4 "Support At $20." In cell GU5 type: =IF(GM5>GO5,GM5-GO5,"None"). Fill down this formula.

17) Label Cell GV4 "Support At $30." In cell GV5 type: =IF(GM5>GQ5,GM5-GQ5,"None"). Fill down this formula.

18) Label Cell GW4 "Support At $40." In cell GW5 type: =IF(GM5>GS5,GM5-GS5,"None"). Fill down this formula.

19) At the bottom of columns GU through GW, calculate the total support for each price support level.

Please note that this procedure, while time consuming, is not difficult to perform.

Table 4

Comparison of BCM2 USF Requirement for Washington State using Default (CBG based) and Wire Center Aggregation Methodology

	Annual USF Requirements			
Price Support Level	CBG Method	Wire Center Method	Difference	Percent Reduction
$20	$279,458,573	$272,701,487	$6,757,086	2.4%
$30	$131,124,036	$107,920,074	$23,203,962	17.7%
$40	$76,625,619	$59,805,364	$16,820,255	22.0%

Note: Support amounts shown correspond to those for the default results for Washington State.

Table 5

Comparison of BCM2 USF Requirement for the Entire United States using Default (CBG based) and Wire Center Aggregation Methodology

(Results extrapolated from Analysis of Washington State)

	Annual USF Requirements			
Price Support Level	CBG Method	Wire Center Method	Difference	Percent Reduction
$20	$14,665,589,457	$14,310,987,170	$354,602,287	2.4%
$30	$7,425,225,158	$6,111,243,011	$1,313,982,147	17.7%
$40	$4,259,037,798	$3,324,127,219	$934,910,579	22.0%

Note: Support amounts shown for the CBG Method correspond to those for the default results for the entire United States.

The feasibility of applying the directives in the California ALJ proposed decision to the BCM2

Note: The following analysis is not intended to address or comment upon the specific merits of the adjustments recommended by the ALJ in the Proposed California PUC Universal Service Decision. Its purpose is to examine the technical feasibility of applying the BCM2 to calculate certain (but by no means all) of the specific adjustments that have been recommended.

Choice of Model

- Neither the BCM nor the BCM2 was proposed in the California USF proceeding
- Two models were proposed in California: Pacific Bell's California Proxy Model (CPM) and the Hatfield Model (sponsored by AT&T and MCI)
- Several models have been filed with the FCC for use in the universal service proceeding:
  - — the Hatfield Model, Version 2.2, Release 2 ("BCM-PLUS"), submitted by AT&T and MCI on September 10, 1996 (Release 1 was submitted on July 5, 1996);
  - — the BCM2, submitted by US West and Sprint on July 3, 1996 (the original version was submitted by US West, Sprint, NYNEX, and MCI on September 12, 1995); and
  - — the California Proxy Model, submitted by Pacific Telesis on May 22, 1995.

Aggregate modifications to the BCM2:

CA: PacBell estimated a statewide USF requirement of $1.7-billion. The ALJ's adjustments to the CPM yielded a revised USF requirement of $248-million, i.e., approximately 15% of the amount that PacBell had claimed was necessary.

BCM2: ETI's analysis demonstrates that regulators can make changes to the BCM2 that result in changes in the USF of a comparable magnitude in order to derive more appropriate results.

Treatment of business lines

CA: High cost funds are not to be provided for serving business customers

BCM2: The BCM2's computation of USF requirements similarly does *not* grant high cost support to business lines. Business lines are included in the BCM2 for network deployment purposes, however. In the BCM2, the inclusion of business lines in the modelled network captures at least a portion of the economies of scale and scope that ILECs enjoy. An alternative way to fully capture the economies of scale is discussed and quantified in the August ETI Report at pages 106-108.

Number of basic lines per residence to subsidize

CA: Only the primary line should be subsidized.

BCM2: Only the primary line is subsidized.

Cost Methodology

CA: ALJ finds that costs should be long run in nature, that the least cost technology that is deployed today should be used, that costs should be foreword looking, and that the costs should be those caused by providing basic residential service.

BCM2: With the appropriate modifications, the BCM2 can reflect this principle.

Fiber/Copper Crossover Point

CA: The ALJ increased the CPM default of 9,000 feet to 12,000 feet.

BCM2: Unlike in the CPM (which measures simply the feeder distance), the copper-fiber crossover point in the BCM2 reflects the *sum* of the feeder distance and a measure called "Maximum Distribution Distance." Furthermore, unlike the CPM, the BCM2 algorithm reflects the capacity

requirement. Therefore, one cannot readily make precisely change that the ALJ has recommended. However, one *can* alter the copper-fiber crossover point in the BCM2 to one of four options ranging between 9,000 feet and 18,000 feet. ETI believes that other values can also be supported by the BCM2, with certain minor modifications to the model software, and that the model could, with such modifications, be used to identify the correct economic crossover point applicable to basic residential access line service.

Because the BCM2 includes the so-called Maximum Distribution Distance, and in order to better gauge the validity of the capacity component of this algorithm, ETI recommends that this algorithm be subject to further detailed scrutiny.

Fill Factors

CA: The ALJ required the CPM to be modified to use objective (or design) fill factors rather than actual fill factors for feeder, and to use PTG's fill factors for distribution which the ALJ "considers extremely generous." The ALJ also stated that "[g]iven that these distribution fill factors include second lines, we are allowing triple the capacity that would be employed serving only one line per household."

BCM2: The BCM2 theoretically uses objective fill factors, but appears to incorporate excess capacity, especially given that actual fill factors are always less than objective (design) fill factors. The BCM2 could also be run using objective fill factors applicable to primary access lines only.

Depreciation (a major component of the cost charge, i.e. carrying factor)

CA: The ALJ directed the use of the Commission-approved depreciation rates rather than Pacific Bell's shorter lives.

BCM2: Depreciation rates are a subcomponent of the three investment-related cost factors in the BCM2. The Sponsors indicated that they used depreciation rates that regulators have approved, but it is not clear whether they are referring to state or federal regulators. The values in the BCM2 for these investment-related cost factors can be readily changed, however, regulators need to compute alternative values that

reflect not only alternative depreciation rates, but also other plant-related expenses. ETI believes that BCM2 can be modified to support *differential* depreciation rates applicable for plant that is used to support basic primary residential access lines vs. plant that is used to support discretionary and competitive services that confront a more volatile demand pattern and that are more susceptible to competitively-driven plant upgrades and replacements.

Benchmark for support

CA: The statewide proxy model weighted average should be used as the benchmark

BCM2: The BCM2 calculates support on the basis of six support levels beginning with $20 and increasing by $10 intervals to $70. In addition, the user may specify a desired support level. Thus, the statewide weighted average cost could be calculated and used as a user specified support benchmark.

APPENDIX A

BCM2 LICENSE AGREEMENT